DISSERTATION ON

ASSESSMENT OF SEVERITY OF ILLNESS ON ADMISSION AND ITS OUTCOME

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CERTIFICATE

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CONTENTS

1. INTRODUCTION

1.1 INTRODUCTION

There has been an exponential development in paediatric critical care in the last 50 years in terms of therapy ,equipment, monitoring and and care of critically ill children. The evaluation and prognostication of cases on admission using scoring systems is of paramount importance. The scoring systems aim at providing an objective measure of severity of illness and hence the prognosis of patients. They help in effective allocation of resources and prediction of outcome and mortality. They are also important for medical audit and in the comparison of cohorts of patients entering clinical trials.

Early identification and proper triage of patients, judicious allocation of resources and personnel , appropriate stratification based on severity of illness is essential for effective management of critical illness which determines the mortality rate in an apex institution. Mortality in critically ill children is maximum in first 24 hours .Timely intervention and management in the first few golden hours can bring about dramatic reduction in mortality rate. To achieve this, proper assessment of severity of illness on admission is mandatory. In paediatrics , scoring systems have been developed to predict mortality in ICU admissions. Of these the Physiological Stability Index (PSI)[1] is one of the oldest .PRISM score is one of the most recent scoring systems of paediatric mortality. However even this scoring system depends on laboratory results and as such is cost and labor intensive. Signs of Inflammation in children that can kill (SICK score) is a validated clinical scoring system with a prediction accuracy equal to the PRISM scoring .The study aims at using the SICK score in a tertiary referral hospital in India to evaluate its usefulness in prediction of mortality and also in helping us in assessing work load in managing sick patients.

1.2 BENEFITS OF SCORING SYSTEMS

Scoring systems provide a measurable, objective value for the outcome variable being studied. Most scores measure probability of mortality. This is useful for

1. Prediction of mortality
2. Proper triage of patients
3. Early intervention
4. Judicious allocation of resources and personnel.
5. Performance assessment and comparison between institutions.
6. Clinical research.

1. 3 HISTORY OF SCORING SYSTEMS

The first scoring system in medical literature was the neonatal scoring system –The APGAR[2] scoring system developed by Virginia Apgar in 1953. The APGAR score aimed to serve as a comparison of the results of obstetric practices, maternal sedation and efficacy of resuscitation by objective assessment of the cardiovascular, respiratory and neurological systems of the newborn.

The introduction of Glasgow Coma Scale by Teasdale and Jenette[3] in 1974 for evaluating the severity of neurological insult is a landmark in trauma care and management.

1.4 TYPES OF SCORING SYSTEM

Scoring systems are based on

1. Anatomical extent of injury

Anatomical scoring systems used in trauma to assess extent of injury. e.g. TRISS- Trauma injury severity score , Pediatric trauma score

2. Physiology based scoring systems

Physiological scoring systems measure the disruption of homeostasis. e.g .PSI (Physiological Stability Index), PRISM score [4,5] (Pediatric Risk of Mortality score).

3. **Based on therapeutic interventions**

Therapeutic Intervention Scoring System [6] and Clinical classification system (TISS and CCS) : The number of therapeutic interventions a patient warrants is measured to reflect the severity and hence the prognosis.

1.4 CURRENT SCENARIO OF THE SCORING SYSTEMS

1.4.1 PRISM III score

A new paediatric physiology based score for mortality risk, Paediatric Risk of Mortality III [7,8] (PRISM III) has been developed. Physiological data include the most abnormal values from the first 12 and second 12 hours of the PICU stay. The PRISM III has 17 physiological variables subdivided into 26 ranges. PRISM III score is a valid predictor of mortality in intensive care units[9].PRISM III score has been used to compare the mortality rates of intensive care units world wide.

1.4.2 Neonatal Scoring System

The neonatal scoring systems include:

a.Score for Neonatal Acute Physiology (SNAP II) [10]

b. Revised Score for Neonatal Acute Physiology Perinatal Extension (SNAPPE II)

c. Clinical Risk Index for Babies(CRIB II)

d. Neonatal Facial Coding Score (NFCS)

Score for Neonatal Acute Physiology (SNAP II)

SNAP II is a valid measure of the severity of illness on admission in neonates. The parameters include Temperature, Blood pressure, Pao2/Fio2, Serum Ph and Seizures. SNAPPE II includes apart from the above parameters small for gestational age and APGAR score at 5 minutes.

Neonatal Facial Coding Score[11,12] (NFCS)

The NFCS measures behavioral pain responses in neonates.The NFCS uses four facial responses: brow bulge, eye squeeze, deepened nasolabial furrow and open lips .The NFCS has been extensively validated and used in neonatal pain research.

Thus Scoring systems have been extensively utilized in the field of medicine ranging from neonatal resuscitation, grading of level of consciousness ,stratifying severity of illness, grading neurobehavioral states, prediction of mortality and research. The purpose of scoring is to categorise illness which helps in early and timely intervention with the available resources thus improving the outcome.

2. REVIEW OF LITERATURE

2.1 NEED FOR CLINICAL SCORING SYSTEMS

The early identification of severity of illness is important for prioritizing treatment and allow proper utilization of limited resources in the developing world. Various scoring systems have been proposed to assess the severity of illness which predict mortality e,g.. PRISM. Most of the scoring systems are for ICU patients which rely on a large number of physical and laboratory variables and require prolonged observation. This makes it unsuitable for practice in developing countries.

WHO developed guidelines for emergency triage, assessment and treatment[13] for sick children presenting to hospitals in the developing world. It prioritized the treatment of sick children depending upon the emergency signs related to airway ,breathing , circulation, coma, convulsion, confusion and dehydration to decrease mortality. The limitation of emergency triage, assessment and treatment is that it requires reorganizing of the existing health care system and special training of both staff and doctor.

In view of this Kumar et al[14] from All India Institute of Medical Sciences developed a score based on physical criteria alone.The SIRS is the host response to presence of an insult regardless of the presence of infection.

SIRS is diagnosed when a patient has two or more of the following criteria as abnormal, which include

1. temperature,

2. heart rate,

3. respiratory rate, and

4 white blood cell count

The children with SIRS may go on to develop multi organ dysfunction syndrome. This team took the physical variables of SIRS and its continuum and excluded the biochemical and laboratory parameters and tested if this score could predict mortality. SICK SCORE is a clinical scoring system consisting of seven variables based on SIRS and APLS guidelines.

The studies done previously in relation to the SICK scoring system primarily look at:

1. Evolving a triage score for severity of illness- SICK score

2. Validation of SICK score.

2.2 EVOLUTION OF SICK SCORING SYSTEM

Kumar et al from the All India Institute of Medical Sciences evolved the SICK score as a triage scoring system for severity of illness based on clinical variables related to systemic inflammatory response syndrome(SIRS).The acronym SICK stands for Signs of Inflammation in Children that can Kill. Consecutive patients admitted to the wards or the Paediatric Intensive Care Unit (PICU) were studied. The respiratory rate, heart rate, capillary refill time. oxygen saturation (SPO2), systolic blood pressure and temperature were noted. Sensorium level was assessed on AVPU score.

Variables were based on SIRS[15,16] criteria and criteria mentioned in Advanced Pediatric Life Support [17] (APLS). Each variable was scored as “0” or “1” (normal or abnormal) and total score for each child obtained. Of 1099 children studied, 44 died. The mortality increased with increase in the number of abnormal variables.0.4%,2.2%,6.1%,15.3%,19.4%and 29.4% for scores of 0,1,2,3,4,and 5 respectively and the linear trend was significant($p<0.01$). Mortality also increased with a decrease in age ($P<0.01$). Children with a score of 2 or more had significantly higher mortality as compared to those with no abnormal clinical variables (score==0). Regression based score was found to predict survival status well. The area under the ROC curve was 0.887, indicating that overall 88.7% of the subjects could be predicted correctly. Maximum discrimination was observed at a score of 2.5 (sensitivity

84.1%,specificity 82.2%).The conclusion of the study was that for triage scoring any child with 2 or more abnormal clinical variables should be taken as serious that might lead to death.

2.3. VALIDATION OF SICK SCORING SYSTEM [18]

The same team from the All India Institute of Medical Sciences validated the SICK scoring system.125 children were admitted and evaluated so that SICK score and PRISM score could be calculated .Of the 125 patients studied, 23 died .The area under ROC was 0.76 using SICK score. Using PRISM in the validation group the ROC was 0.78.Thus the Sick score was able to predict mortality with the same accuracy as that of PRISM score .This clinical scoring system can be used at the time of admission which can help to prioritize care and to obviate harmful delays.

Thus, simple easily applicable clinical scoring systems devoid of laboratory investigations have become a real necessity more so in the developing world with limited resources. Scoring systems that can be applied at primary level will help in early identification of critical illness so that prompt intervention can reduce mortality

3. STUDY JUSTIFICATION

The mortality in a tertiary level apex institute depends on the early identification and effective management of critical illness.

In view of rapid developments in management of critical illness, coupled with the spiraling cost of critical care, outcome analysis including prediction of mortality based on assessment of severity of illness on admission is important for the physicians.

Institute of Child Health and hospital for Children is a tertiary care centre in the government sector which is the principal referral unit in South India providing treatment free of cost for children from Tamilnadu .The mortality rate in ICH was 4.9% and the mortality rate in the Pediatric Intensive Care Unit in ICH was 40.8% in the year 2006 .

As the institute is catering to a large population of poor children providing high quality critical care with limited resources, mortality prediction will be useful in prioritising critical care and in effective allocation of available resources. The PRISM III score is a very good predictor of mortality, but it has some limitations.

The scoring is done within 24 hours after admission and requires laboratory investigations. Since the mortality is highest in the first 24 hours, assessment of severity of illness on admission and early intervention within the golden hour can bring about a dramatic reduction in mortality. Therefore the need for a clinical scoring system for predicting mortality on admission is a real necessity. The SICK score is a validated clinical scoring system that can predict mortality on admission.

4. OBJECTIVES

PRIMARY

To validate the usefulness of SICK score in predicting mortality in a government tertiary care hospital in Chennai.

SECONDARY

To identify the factors contributing to mortality.

5. METHODOLOGY

5.1 STUDY METHODOLOGY

Evaluation of scoring system(diagnostic test). This study is a prospective study using a clinical scoring system namely SICK scoring system to assess the severity of illness on admission and compare it with outcome in the Institute of Child Health and Hospital for Children (ICH&HC),Chennai. The mortality rate of ICH is 4.9% and the calculated sample size with a precision of 2% and alpha error fixed at 5% is 448. All patients admitted on Monday under M1 unit where I was working formed the study population. The duration of study was one year. Children below the age of one month, patients leaving the hospital against medical advice, patients admitted in the surgical side and patients dying in the emergency room were excluded from the study

Children who require admission are admitted to the wards from the casuality. Children who are very sick are initially resuscitated in the emergency room and then shifted to the wards or the Pediatric Intensive Care Unit (PICU) depending on the severity of illness.

5.2 MANOEUVRE

The children admitted through the emergency room are assessed with the SICK score in the emergency room itself. For children admitted directly to the ward, the assessment using SICK Score was done in the ward prior to the initiation of treatment. The variables –temperature, heart rate, respiratory rate, systolic BP, oxygen saturation, CRT, sensorium by AVPU scale were noted on a pre-designed proforma at the time of admission.

Oxygen saturation (Spo2) was measured by pulse oximetry. Blood pressure was measured using sphygmomanometer using appropriate size cuff. Both systolic and diastolic blood pressure was measured. Axillary temperature was measured using mercury thermometer. Abnormal values for heart rate, respiratory rate, temperature, and blood pressure were according to standard SIRS criteria. Consciousness was noted using AVPU score. Except alert (A) of AVPU, all other states of consciousness were taken as abnormal. AVPU was taken for rapid assessment of sensorium because it requires only four observations for its assessment. The abnormal values for Spo2, Capillary refill time and AVPU were as per Advanced Paediatric Life Support. Normal values were assigned a score of 0 and abnormal values assigned a score of 1. The hospital discharge status (death/survival) was the primary outcome variable.

Table.5.1 Scoring of Abnormal Clinical Variables

Variable	Abnormal range
Temperature	>38◦c <36◦c
Heart rate	Infant>160 per minute Child >150 per minute
Respiratory rate	Infant>60 per minute Child >50 per minute
Systolic blood pressure	Infant<65 mm Hg Child < 75 mmHg
Spo2	90%
Capillary refill time	≥ 3 seconds
A Alert	Anyone except A
V Responds to voice	
P Responds to pain	
U Unresponsive	

Based on SIRS and APLS

6. ANALYSIS OF OBSERVATION

6.1 ANALYSIS

The study was carried out by enrolling 369 children and the collected data was analysed using SPSS software package. Quantitative data differences between children who died and children who were discharged from the hospital were analysed using student independent t- test. Cut off point of SICK score for mortality was arrived using Receiver Operating Curve (ROC)

Need for assisted ventilation, presence of shock, age and SICK score >2 were studied to find out their association with mortality. Statistical analysis was done using both univariate and multivariate analysis. Factors that seemed to contribute significantly to mortality after univariate analysis were further analysed using logistic regression multivariate model.

6. 2 RECEIVER OPERATING CURVE

During validation of a scoring system, the discrimination and calibration are measured. Discrimination tests the ability of a model to determine patients who live (when death is the outcome variable) from the patients who die. The cut off points are plotted to give Receiver Operating Curve (ROC).The greater the true positive rate to the false positive rate, the greater is the area under the ROC .The area may range from 0.5 (purely due to chance) to 1.0 (perfect).Calibration tests the extent of agreement between the expected and actual number of hospital deaths across subgroups of patients, The agreement across the whole range is tested using the goodness of fit statistics. The ROC is a graphical representation of the discriminative power of a test. Any biological variable has a range of normal values. Optimal cut off is required where both sensitivity and specificity are optimal. For any particular test (a laboratory value or scoring system), various cut off points are plotted as sensitivity (true positives) against true negatives (1- specificity).The resulting curve is the ROC. The curve demonstrates the discriminative power (example to separate recovery from death in a mortality score) at various score points. The test is said to have good performance if the area under the curve nears 1.A 0.5 result is interpreted as worthless as this could be by pure matter of chance and the laboratory test or scoring system does not have a good discriminative power.

A rough guide for classifying the accuracy of a diagnostic test is the traditional academic point system.

.90-1=excellent (A)

.80-.90= good (B)

.70-.80= fair (C)

.60-.70=poor (D)

.50-.60= fail

Receiver Operating Curve was used to arrive at the cut off point of SICK score for predicting mortality.

7. RESULTS

7.1 RESULTS

Children who fulfilled the inclusion and exclusion criteria were enrolled in the study. A total of 369 children were studied. The results are presented in the following order.

- ❖ **OVERALL CLINICAL PICTURE**

  Age distribution

  Sex distribution

  Clinical diagnosis

  Mortality

- ❖ **OVERALL SICK SCORE**

  SICK score

  SICK score and mortality

  Receiver Operating Curve (ROC)

- ❖ **CLINICAL PROFILE OF CHILDREN ADMITTED TO PICU**

SICK Score

Mortality

SICK score and mortality

Clinical diagnosis

Need for ventilatory support

- **UNIVARIATE ANALYSIS**
- **MULTIVARIATE ANALYSIS**

7.2 OVERALL CLINICAL PICTURE

The clinical picture was studied in relation to age distribution, sex distribution and mortality.

7.2.1. Age Distribution

Children between the age groups 1 month to twelve years were included in the study .The mean age in the study was 39.7 ± 4.01 months as depicted below.

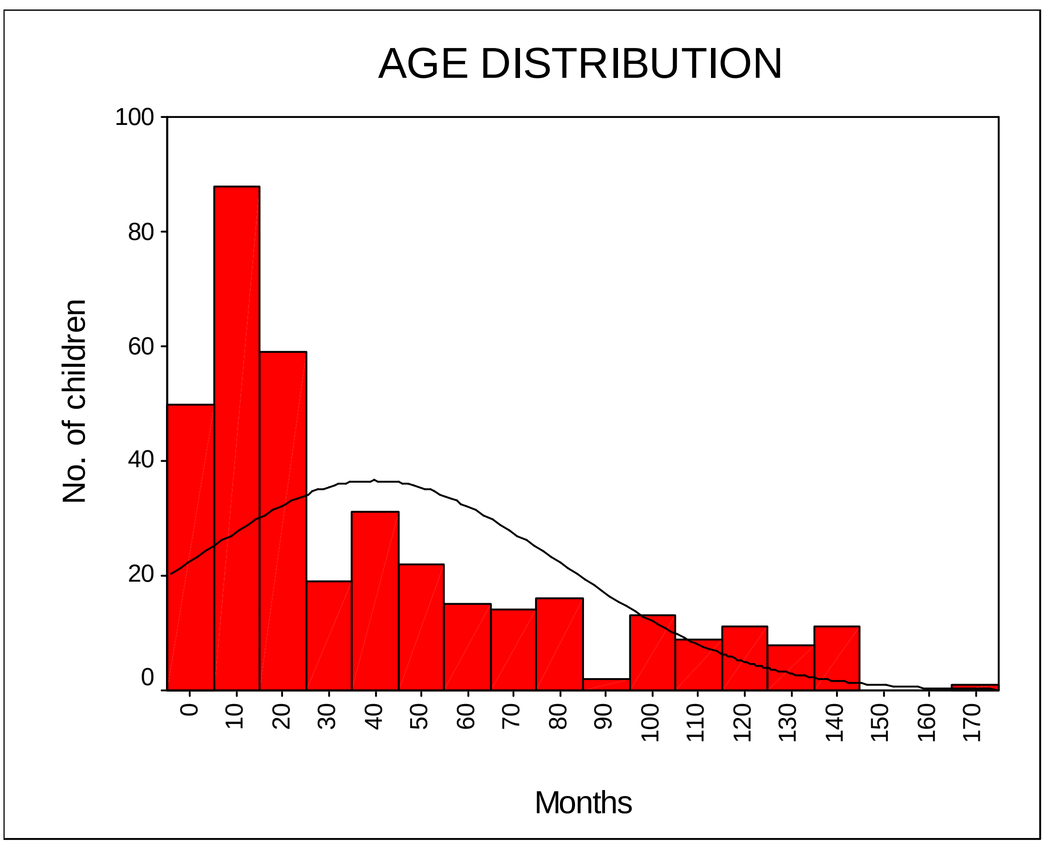

Fig 7.1 Chart showing age distribution of children

7.2.2. Sex Distribution

In this study of 369 children, 225 were males and 144 were females as depicted in the graph below.

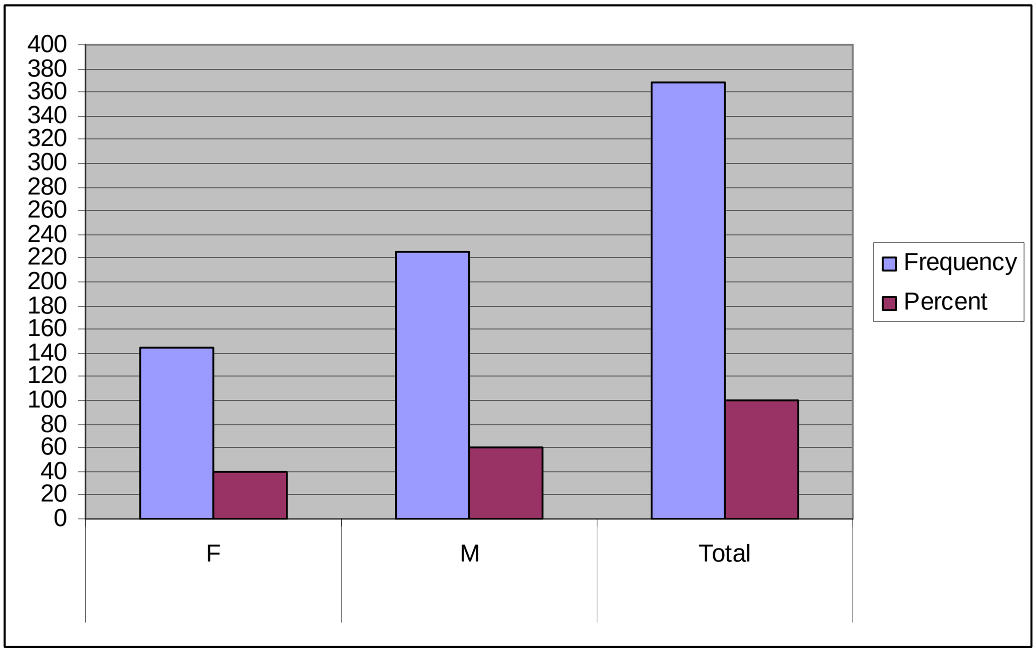

Figure 7.2 Graph showing sex distribution.

7.2.3. Clinical diagnosis

Diagnosis of the children enrolled was classified based on the system involved and the distribution of the diseases is given below. System wise classification was done. The group infection was defined as those with no definite focus of infection and who were not classified under any particular system .If a child had both clinical and investigative evidence of a definite focus of infection, he or she was classified under that system.

TABLE 7.1 Clinical Diagnosis

System	n
Cardiac (C)	**44**
Gastro intestinal (G)	**20**
Haematologic (H)	**11**
Infectious (I)	**53**
Neurological (N)	**70**
Others (O)	**14**
Poisoning/ accidents (P)	**13**
Respiratory (R)	**97**
Sepsis (S)	**16**
Renal (U)	**30**
Total	**369**

Respiratory diseases followed by neurological causes were the commonest cause for admission. The clinical diagnosis is depicted in the graph below.

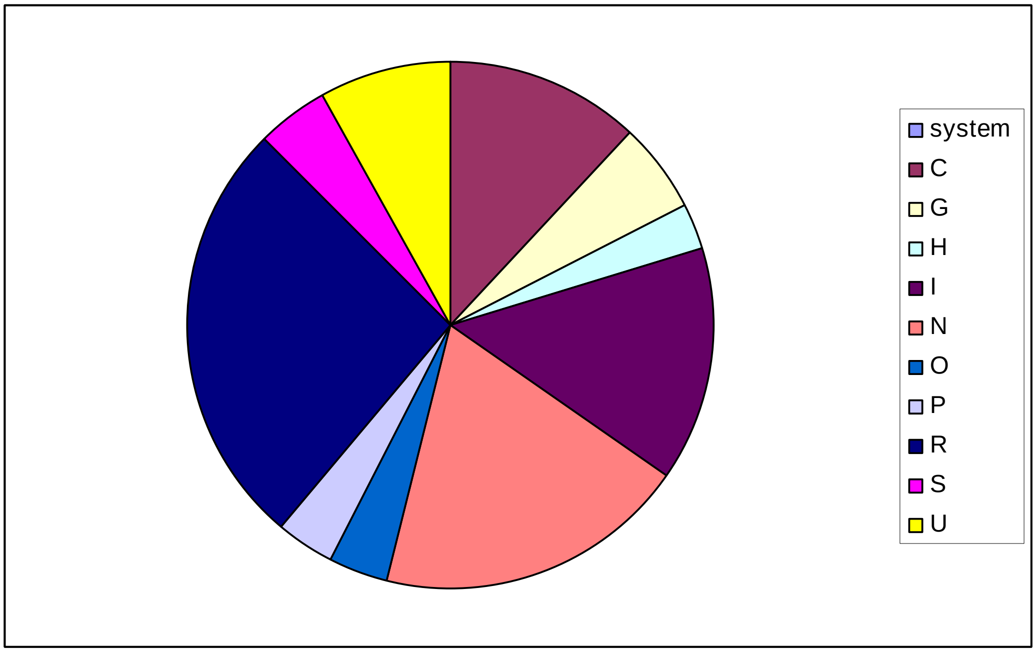

Figure 7.3 Pie chart showing clinical diagnosis.

C- cardiac G –gastrointestinal

H –hematological I - infectious

N – neurological P –poisoning/accidents

R – respiratory S – sepsis

U – renal O – others

7.2.4 Mortality

Respiratory diseases were the major cause of admission followed by neurological conditions. Mortality was highest in patients presenting with sepsis followed by cardiac ailments. Diabetes, addisons disease, drug reactions and anaphylaxis were included in others category.

Table 7.2 .Clinical diagnosis and mortality

System	Discharged	Died	Total
Cardiac (C)	37	**8**	44
Gastro intestinal (G)	20	**0**	20
Haematologic (H)	11	**0**	11
Infectious (I)	53	**0**	53
Neurological (N)	66	**4**	70
Others (O)	14	**0**	14
Poisoning/ accidents (P)	12	**1**	13
Respiratory (R)	96	**1**	97
Sepsis (S)	7	**9**	16
Renal (U)	29	**1**	30
Total	345	**24**	369

a. Duration of Stay and Mortality

The average duration of hospital stay in was 53.88 hours among those who died and 106.16 hours among those who were discharged.

Table 7.3 Duration of stay and mortality

Duration of stay (in hrs)		N	Mean	Std. Deviation	Student independent t- test
	Death	24	53.88	82.686	t=3.04
	Discharged	345	106.16	81.184	P=0.02

b. Age and Mortality

The average age of the children in the study is 39.7 ± 4.01 months. The average age of the children who died is 20 months as against 40 months in children who were discharged. This clearly shows that mortality increases with decrease in age as shown in the following table. **(P=0.01)**

Table 7.4 Age and mortality

Status		N	Mean	Std. Deviation	t-test
Age in Months	**Death**	**24**	**20.25**	**25.000**	**t=3.76**
	Discharged	**345**	**41.14**	**40.682**	**P=0.01**

<u>**Mean difference with 95% confidence interval =20.89(4 - 37)**</u>

Age <3 years and mortality.

The average age of the children in the study is39.7±4.01 months and the average age of the children who died is 20 months. Based on this, age<3 years was further analysed to find its association with mortality. Age less than 3 years showed statistically significant association with mortality.

Table 7.5. Age<3 years and mortality

Age	Discharged		Mortality	
	N	%	n	%
>3 years	127	98.4	2	1.6
<3 years	218	90.8	22	9.2

p value-0.005

c, Sex and mortality

Sex of the children did not show any statistical significance with mortality.

Table.7.6.Sex and mortality

Sex	Discharged		Mortality	
	n	%	n	%
Male	207	92	18	8
Female	138	95.83	6	4.17

p- value 0. 14

d. Presence of shock and Mortality

Out of the 369 children 73 children presented with shock. Patients presenting with shock were analysed statistically with those who did not present with shock . Presence of shock was significantly associated with mortality.

Table 7.7 Presence of shock and mortality

	Discharged		Mortality	
	n	%	n	%
Presence of Shock	51	69.86	22	30.14

P- value 0.001

e. Assisted ventilation and Mortality.

In this study, 18 children required assisted ventilation. As requirement for assisted ventilation is a risk factor for poor outcome ,it was analysed statistically. The analysis showed clearly that there was a significant correlation with need for assisted ventilation and mortality.

Table.7.8.Need for assisted ventilation and mortality.

	Discharged		Mortality	
	n	%	n	%
Assisted ventilation	4	22.2	14	77.8

P- value 0.001

7. 3 OVERALL SICK SCORE

The SICK score was studied relation to distribution in the study population,its relation to mortality and its ability to predict mortality using Receiver Operating Curve

7.3.1.Distribution of SICK score

The SICK The minimum Sick score in this study is 0 and the maximum score is 7 with a mean of 1.08.The median is 0 and the mode is 0.Clustering of cases is seen at scores 0 and 1.

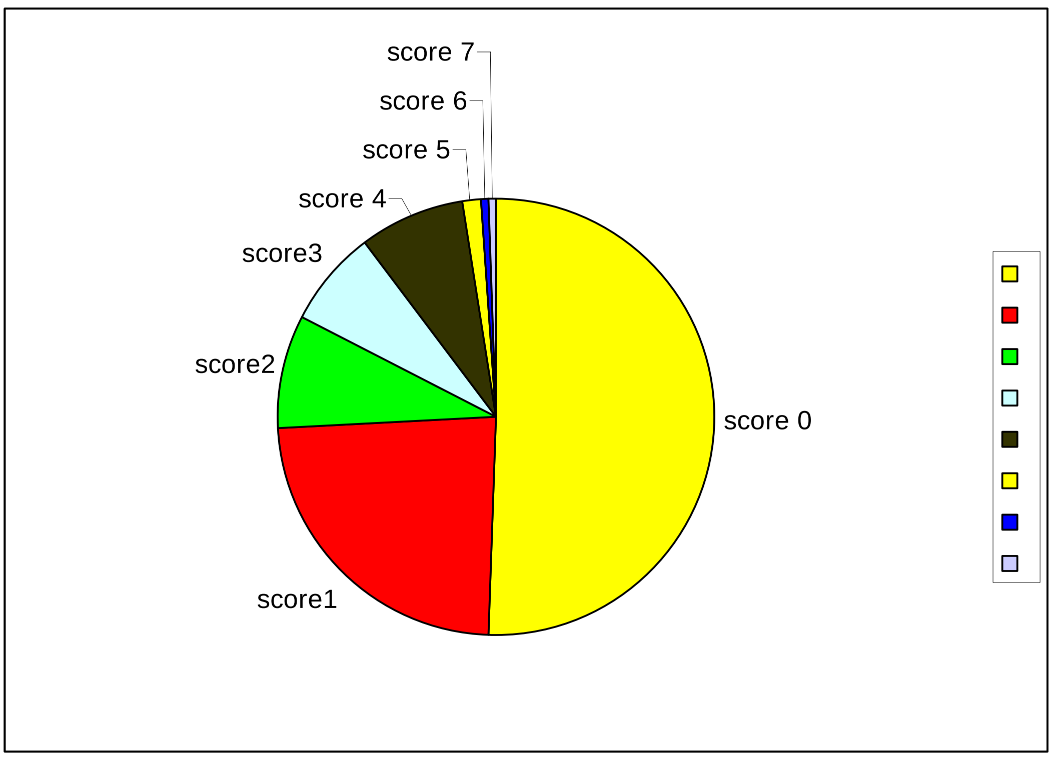

Figure 7.4. Pie chart showing distribution of SICK score

Table 7.9 Distribution of SICK score

Score	Frequency	Percent
0	186	50.4
1	87	23.6
2	31	8.4
3	27	7.3
4	28	7.6
5	6	1.6
6	3	0.81
7	1	0.27
Total	369	100.0

7.3.2. SICK score and mortality

Out of 369 children studied 24 died. The mortality in the study is 6.5%. Mortality risk was found to be increasing with increase in the score. There was no death in patients with 0 score. The relationship between SICK score and mortality is tabulated below.

Table.7.10 SICK score and Mortality

Score	Status			
	Discharged		Died	
	N	%	n	%
0	186	100	0	**0**
1	86	98.8	1	**1.2**
2	29	93.5	2	**6.5**
3	22	81.5	5	**18.5**
4	19	67.9	9	**32.1**
5	2	33.34	4	**66.66**
6	0	1	2	**66.66**
7	0	0	1	**100**

The mortality increased with increase in the SICK score which is depicted in the following graph.

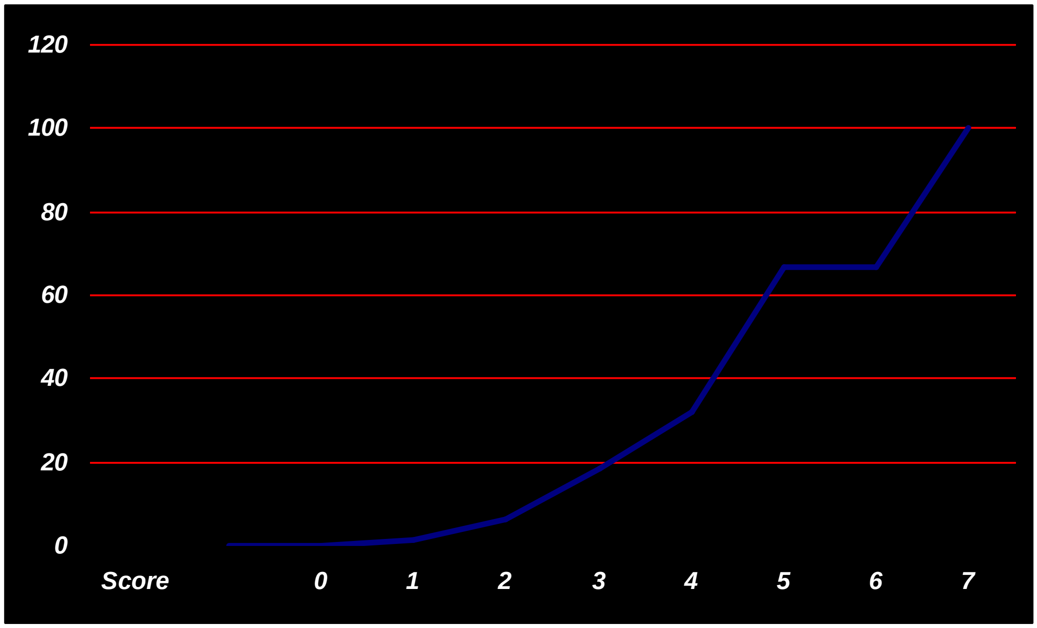

Figure 7.5 Graph showing SICK score V/s mortality.

The X-axis and Y-axis represent sick score and mortality % respectively.

Ranges of SICK score and mortality

Mortality increased with increase in the number of abnormal variables.The score ranges and the odds ratio are given in the table below.The linear trend of increase in mortality with increasing score was significant(p=0.001).

Children with more than three abnormal variables (SICK score>3) had 168 times higher mortality risk than childen who children who had three or less than three abnormal variables.

Table.7.11.Ranges of SICK score and mortality

Score	**Discharged**	**Death**	**Mortality%**	**OR**
0-1	272	1	0.36	1.00
2-3	51	14	21.5	37.3
>3	22	7	24.13	168

$\chi 2$ (trend method)= 105.1,p=0.001

Children with SICK score ≤2 and those with score>2

Based on experience with the previous studies ,cutoff for the SICK score which delineates the higher mortality risk from the lower mortality risk was calculated as 2 and analysis was done for those who had score more than 2 and those who had 2 and below, which showed a p value of 0.001 which was statistically significant.Those who have a score of less than 2 had a mortality risk of 0.98% and those who crossed it had 32.3% mortality risk.

Table.7.12 SICK score >2 and mortality

Sick score		status			
		Discharged		Death	
		n	%	n	%
	<=2	301	99.02%	3	0.98%
	>2	44	67.7%	21	32.3%

$\chi 2$=86.39 P=0.001 OR 95%CI; 48(13 – 211)

7.3.3. RECEIVER OPERATING CURVE

In our study, the area under the ROC curve is 0.94,that is the scores based on regression could predict mortality in 94% subjects correctly. Further a score of 2.5 showed maximum discrimination with a sensitivity of 87.5% and specificity of 87.2%.The SICK score would be considered to be "Excellent" at predicting mortality based on the area under the curve.

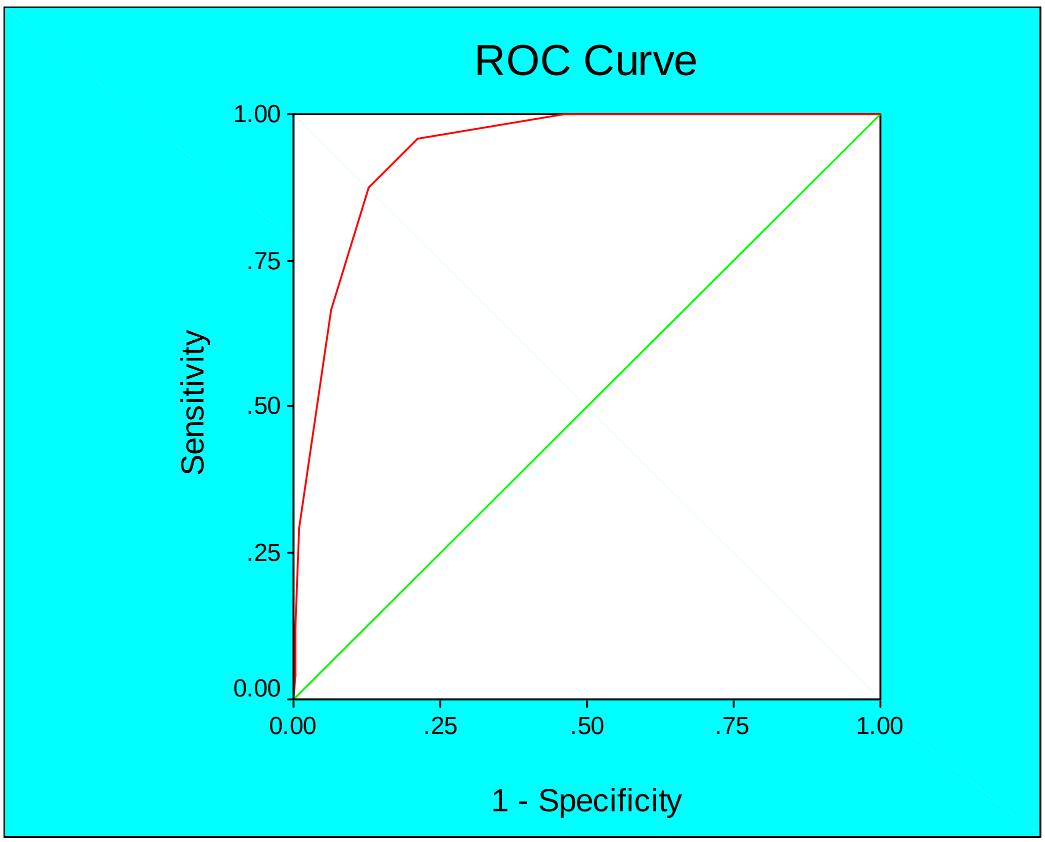

Figure .7.6 Receiver Operating Curve

Area under the curve = **0.94; P=0.001**

7.4. CLINICAL PROFILE OF CHILDREN ADMITTED TO PICU

Out of the 369 children, 18 children were treated in the Pediatric Intensive Care Unit(PICU) . Out of the 18 children,13 children were directly admitted from the emergency room and the rest of them were transferred in from the ward who became sick and required intensive care. Among the 5 children who were shifted from the ward following in detoriration in their clinical status, 4 survived and all of them had a score of ≤2. and only one child died .The SICK score for this child on admission was 4 and this re-emphasises the fact that mortality is high for children with higher score.

7.4.1. SICK Score

The average score of the patients treated in the PICU was 3 as depicted in the graph below.

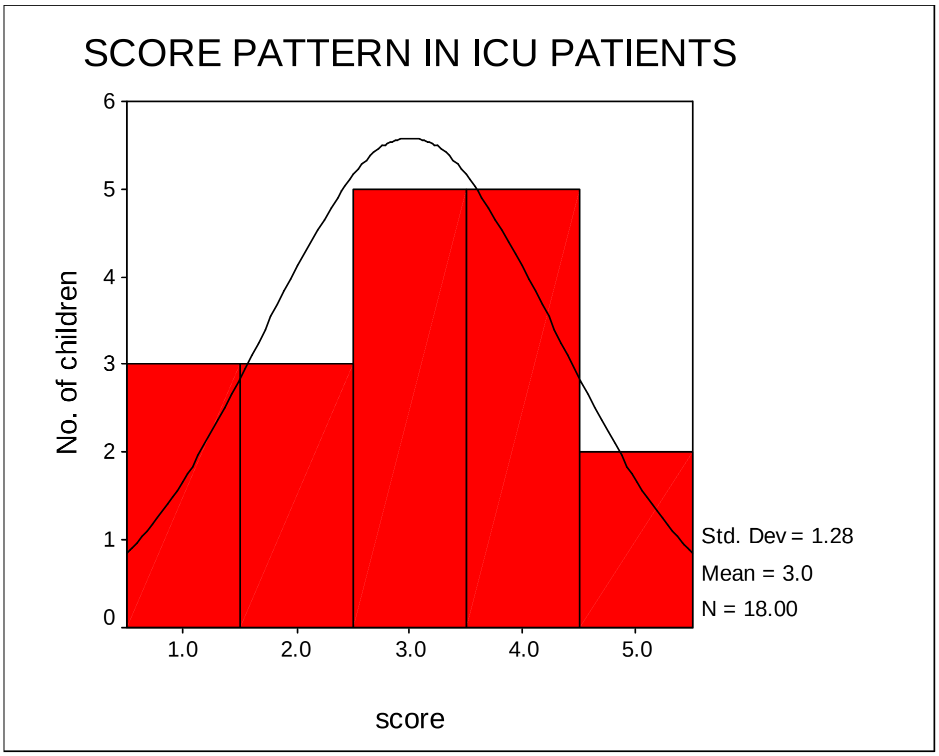

Figure 7.7.Score pattern in PICU patients

7.4.2. Mortality

Out of the 18 children treated in PICU, 13 were discharged and 5 died. The mortality rate in PICU was 28%.

7.4.3. SICK Score and Mortality.

The mortality increased with increase in the SICK score which is depicted in the following graph.

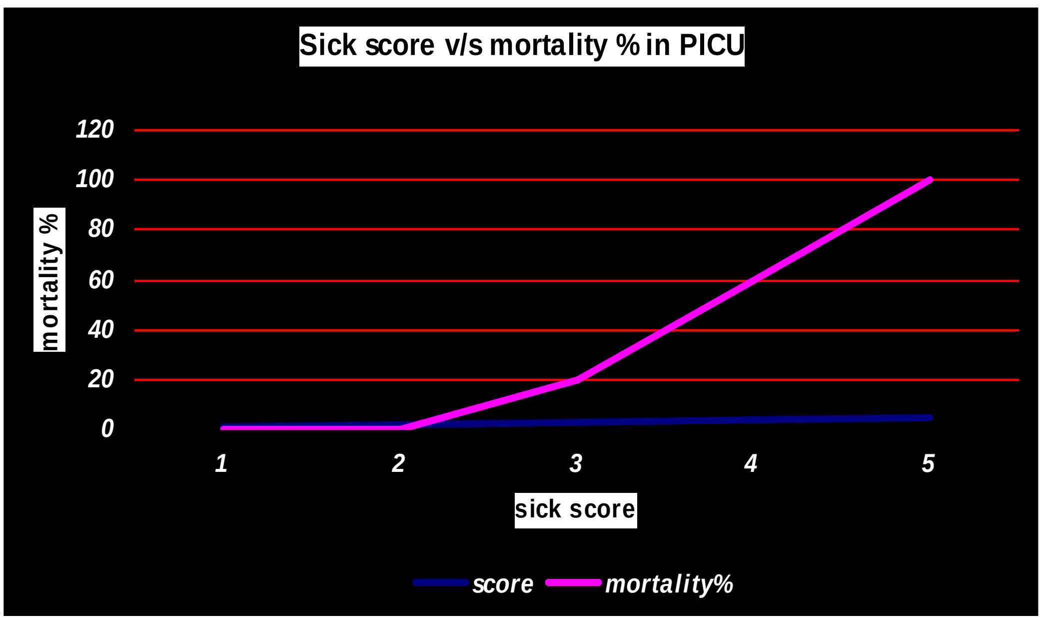

Figure.7.8.Graph showing SICK score v/s mortality in PICU

Table.7.13.SICK score and mortality in PICU

Score	Status			
	Discharged		Death	
	n	%	n	%
0	0	0	0	**0**
1	3	100	0	**0**
2	3	100	0	**0**
3	4	80	1	**20**
4	2	40	3	**60**
5	0	0	2	**100**
6	0	0	0	**0**
7	0	0	0	**0**

7.4.4. Clinical Diagnosis

Diagnoses of the children treated in the PICU were classified based on the system involved and the chart showing the clinical diagnosis is given below. Cardiovascular diseases and sepsis were the major cause of admissions to the PICU.

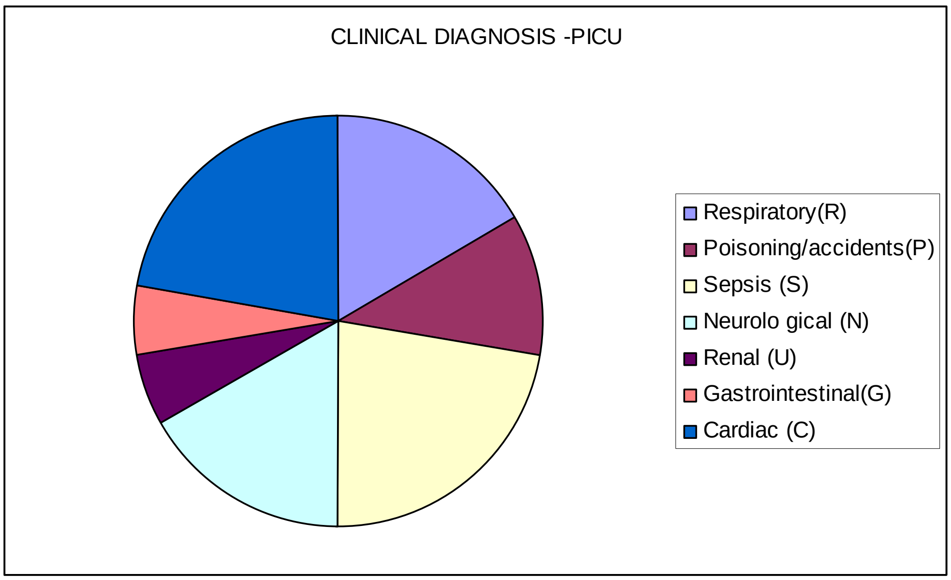

Figure 7.9.Pie chart showing Clinical Diagnosis in PICU

Cardiac	=	**23%**
Sepsis	=	**23%**
Respiratory	=	**17%**
Neurological	=	**17%**
Accident / Poisoning	=	**8%**
Renal	=	**6%**
Gastro intestinal	=	6%

7.4.5. Need for assisted ventilation and mortality in PICU

Out of the 18 children, 7 required assisted ventilation of which 3 were discharged and 4 died. Need for assisted ventilation showed statistically significant association with mortality.

Table 7.14 . Need for assisted ventilation and mortality.

		Discharged	Death	Total
Vent Assist	No	10	1	11
	Yes	3	4	7
Total		13	5	18

$\chi2$=fisher exact test =p=0.05

7.5 UNIVARIATE ANALYSIS

Age less than 3 years, presence of shock ,need for assisted ventilation and SICK score >2 were subjected to univariate analysis.All had a significant p value.Need for assisted ventilation had the highest odds ratio than the other two.Patients who needed assisted ventilation had 119 times higher mortality risk than children who did not need it.Children who presented with shock had 63 times higher mortality risk than children who did not present with shock.Children with SICK score >2 had 48 times higher mortality risk than children who had a SICK score ≤ 2.The mortality risk was 6 times higher in children less than 3 years of age.

Table 7.15 Univariate analysis

	Odds Ratio	95% CI	p-value
Age<3years	6.4	1.5-40	**0.005**
Shock present	63	14-403	**0.001**
Assisted Ventilation	119	29-535	**0.001**
SICK Score>2	48	13-211	**0.001**

7.6 MULTIVARIATE ANALYSIS

Risk factors that were found to contribute significantly to mortality by univariate analysis were further analysed using logistic regression multivariate model. Age <3 years, presence of shock, need for assisted ventilation and children with SICK score>2 showed statistical significance with mortality.

Table.7.16 Multiple logistic Regression

	O.R	**95% CI**	**p- value**
Age< 3 years	6.987	1.123-43.468	**0.03**
Shock present	25.021	5.155-121.451	**0.001**
Assisted Ventilation	20.563	5.382-78.560	**0.001**
SICK Score>2	20.79	5.25-82.35	**0.001**

The multivariate analysis revealed that the mortality risk was 6 times higher in children less than 3 years of age,25 times higher in children with shock, 20 times higher in children requiring assisted ventilation and 20 times higher in children with a SICK score >2..Though all the above factors had significant association with mortality, the association of SICK score >2 and need for assisted ventilation and mortality was statistically more significant as they had a narrow 95% confidence interval.

8. DISCUSSION

Many scoring systems for assessing severity of illness have evolved over the recent years along with an exponential development in management of critical illness. The importance of these scoring systems in assessing severity of illness needs to be emphasized indeed ,especially in the developing world where resources are limited and the need for care is overwhelming. More so, the concept of assessment of severity of illness on admission using a clinical scoring system is the real need of the hour.

This assessment on admission has certain advantages. It is a true measure of the physiological instability with which the patient presents in the emergency room. A proper assessment of this physiological instability on admission is a prerequisite for appropriate early intervention in the golden hour which paves way for a drastic reduction in the mortality rate of the institution. The SICK scoring system is a clinical scoring system with these advantages.Although the PRISM score is a good predictor of mortality it is not a measure of the physiological and hemodynamic instability with which the patient arrives ,as the scoring is done within 24 hours after admission. Also it needs extensive laboratory investigations, the cost of which is a limiting factor.

The performance of the SICK score in our study was “excellent” in prediction of mortality with ROC analysis having an area under the curve of 0.94 (94 % correct prediction of mortality) and with a p value of

0.001.Kumar et al from the All India Institute of Medical Sciences found in their study using SICK score the area under the ROC to be 0.76 (76 % correct prediction of mortality). Further in our study a score of 2.5 showed maximum discrimination with a sensitivity of 87.5% and a specificity of 87.2%. Mortality also increased with decrease in age (p=0.01).

By univariate analysis, age less than 3 years, presence of shock, need for assisted ventilation and SICK score >2 were significantly associated with mortality. These factors on further analysis by logistic regression multivariate model showed significant association with mortality.

In a previous study done in the Institute of Child Health, Chennai in the year 2006 to validate the usefulness of PRISM III score in predicting mortality in the Paediatric Intensive Care Unit involving the same population, the area under ROC was 0.853(85 % correct prediction of mortality).

The SICK score has performed better than PRISM score in predicting mortality in this population with the area under ROC being 0.94.Further as already mentioned it assesses the physiological instability of the patient on arrival and paves way for early intervention.

The assessment of SICK score in the population will provide

1. Objective measure of severity of illness on admission.
2. Prediction of mortality.
3. Early triage of patients.
4. Effective allocation of resources and personnel.
5. Enables early intervention, which helps in reducing mortality.

9. CONCLUSION

From the above results and discussions, the following conclusions are arrived.

- SICK Score is a clinical scoring system devoid of laboratory parameters which can be applied with ease.

- SICK score provides an objective assessment of severity of illness on admission.
- SICK score performed extremely well in predicting mortality in a tertiary care centre in Chennai.
- SICK score, being a clinical scoring system can be applied at all levels of health care to prioritize and identify critically ill patients, who would benefit from prompt referral to a higher centre, especially in regions of resource poor environment.

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ANNEXURE

PROFORMA- SICK SCORE

Name: Age: Sex IP .NO

Date of admission and Time: Time of assessment: Weight

Case admitted to IMCU/WARD Admitting unit:

Variable	Obtained value	Abnormal range	Score(normal=0 Abnormal=1)
Temperature		>38◦c >36◦c	
Heart rate		Infant>160/min Child>150/min	
Respiratory rate		Infant>60/min Child>50/min	
Systolic		Infant<65mmHg Child<75mmHg	
Spo2		<90%	
Capillary Refill Time		≥ 3 sec	
AVPU A- Alert V-responds to voice P-responds to pain U-Unresponsive		Anyone exceptA	
Total Score			

Airway Colour Pulse Others

Retractions Liver span Bradycardia Tone/posture

Apnoea Grunt Bagging done Assisted ventilation

FOLLOW UP OF CASES IN WARD/IMCU

Duration of stay

IMCU
WARD

Brief course with
important investigations}

Diagnosis

DEATH	DISCHARGE
Date :	Date:
Time :	Time:
Cause of Death	condition on discharge

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Certificate

The dissertation committee for 2007, Institute of Child health and Hospital for Children, Madras Medical College, Chennai comprising of the following members has granted permission to MD postgraduate Dr.N.Rajeswari to proceed with her study titled **"Assessment of severity of illness on admission and outcome"** after carefully scrutinizing her study proposal with special reference to ethical standards, methodology and relevance. Her study proposal was approved on 27.9.2007

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